ISP

End-User Systems Implementation Approaches that Work

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END-USER SYSTEMS IMPLEMENTATION APPROACHES THAT WORK

ABSTRACT

The market for office systems is currently undergoing some significant changes stimulated first by the introduction of the professional microcomputer workstation, and second by the introduction of electronic filing and electronic publishing systems.

This report is designed to help IS and office system (end-user) managements, as well as top executives, understand the profound implications of these events and adapt to them. It identifies market forces and trends and provides guidelines for justifying advanced office systems, avoiding pitfalls, and planning and organizing; and it presents approaches to implementation that are based on the successful experience of leading users.

This report contains 82 pages, including 14 exhibits.

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CONTENTS

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EXHIBITS

I INTRODUCTION

- This report is part of the INPUT End-User Systems Planning Program. The objective of the report is to provide insights and guidance for information system (IS) management based upon the experience of end users in the implementation of advanced office systems. This includes identifying and describing:

  - Methods leading to the successful implementation of advanced systems that promote the integration of office functions and enhance productivity.

  - Pitfalls in the planning, selection, and implementation of such systems, and ways and means for avoiding them.

  - Measures of productivity, cost savings, and other benefits that have been used to justify implementation.

  - Roles and missions of end-user and IS departments in the justification, planning, design, implementation, and operation of advanced office systems.

- This report distinguishes between end-user office systems and IS or computer systems.

- End-user office systems are defined here as comprehensive and integrated sets of activities and resources designed to serve specific office functions such as:

  . Accounting.

  . Correspondence.

  . Communications.

  . Decision making.

  . Publishing/documentation.

  . Filing.

- IS or computer systems are that portion of end-user systems that can be performed by computer hardware and software with the assistance of human operators and maintenance personnel. They include:

  . Data processing.

  . Word processing.

  . Electronic mail.

  . Decision support.

  . Electronic publishing.

  . Electronic filing.

- INPUT chose two approaches to the integration of office functions as subjects for the research. These two approaches are communications and office systems.

  - The establishment of communications between components of office systems or between combinations of office systems includes micro-mainframe linkages and local area networks (LANs). Technically, these are subsystems of office systems, but they are so important to the functioning of office systems and integration that they deserve separate treatment.

  - INPUT chose three office systems--decision making, documentation, and filing--that have recently yielded to computer technology. The corresponding information systems are capable of performing key office functions on a standalone basis, but their performance is considerably enhanced if they have access to other information systems such as data processing and word processing.

- Communications:

  - Micro-mainframe linkages: The means for communicating between a multifunctional microcomputer workstation (e.g., a link) and a "host" mini or mainframe computer for the purposes of:

    . Sharing data, text, and files.

    . Sharing input, output, storage and processing functions, and facilities.

    . Sharing programs.

    . Electronic mail.

- Local area network: An information transmission system with three or more nodes that operates under a standard set of protocols governing communications between nodes. Nodes may consist of computers, terminals, workstations, disk and tape storage devices, and printers, as well as gateways to other networks or nodes. Whereas micro-mainframe linkages and LANs are capable of performing many of the same functions of communications, LANs offer significant advantages.

- Office systems:

  - Decision support systems (DSSs): Computer-aided information storage, retrieval, and analysis to support decision making and planning in commercial, industrial, and public institutions.

  - Document composition systems: Office systems specifically designed for composing documents containing data, text, graphics, and/or images in preparation for printing. (The process is also known as page makeup, or pagination.) Document composition is a key component of electronic publishing, portions of which are still under development or are too expensive for most business applications. It was preceded in the markeplace by word processing.

  - Electronic filing: Office systems specifically designed to acquire, store, and retrieve reproductions of original documents that contain data, text, graphics, and/or images. To qualify, such systems must be capable of digitizing, storing, and reproducing images with resolutions of 200 dots per inch or higher. They must also be able to transmit images of documents between any component in the system and to compatible systems.

- Since the technologies for document composition and electronic filing are very similar, the two are sometimes combined into a single electronic filing and document processing system.

- All of the above systems possess the ability to integrate or at least to facilitate the integration of other major office functions. All are of relatively recent origin. They were selected for study because they represent major new developments in the technology of office systems with the potential for making significant changes in office organization, staffing, and operation. In addition, end users and IS managers express strong interest in them.

- To meet the objectives of the study, an in-depth telephone survey was conducted of corporations and government agencies known to have successfully implemented one or more of the advanced office systems defined above.

  - Since these systems are relatively new to the market, the survey sample necessarily consisted of leading users of office automation systems.

  - Because the sample was not intended to represent the total population of potential users or vendors, the research did not address market estimates or competitive conditions.

  - The survey sample was drawn from a recent INPUT survey wherein respondents graded themselves vis-a-vis other users in terms of their office automation technology.

  - End-users who classed themselves as leading edge were first screened, to determine which had the subject advanced systems in operation and thereby qualified as respondents.

  - Thirteen companies and government agencies that possess 19 of the advanced office systems defined earlier were represented in the sample. The survey yielded a total of 11 in-depth interviews. (A copy of the questionnaire appears in Appendix A.)

- The research benefited considerably from earlier investigations conducted by INPUT in related fields. The reader is referred to the following INPUT reports for details:

  - Impact of Office Systems on Productivity.
  - Methods of Cost/Benefit Analysis for Office Systems.
  - Local Area Networks: Directions and Opportunities.
  - End-User Micro-Mainframe Needs.
  - Micro-Mainframe: Telecommunications.
  - Impacts and Challenges of Decision Support Systems.

II EXECUTIVE SUMMARY

- This executive summary has been prepared in presentation format in order to:
  - Help the busy reader to quickly review the main conclusions and recommendations.
  - Provide a useful format for group presentations.
- The key points of the report are summarized in Exhibits II-1 through II-6. On the left-hand page facing each exhibit is a script explaining its contents.

A. CURRENT TRENDS: THE OFFICE PRODUCTIVITY NETWORK

- Trends that are expected to influence the evolution of office systems for the next few years (at least) include:

  - Increasing acceptance of multifunctional workstations based on microcomputers.

  - Pressures for application software with shared functionality between micro and mainframe.

  - Increasing integration with existing systems.

  - Introduction of multifunctional office systems.

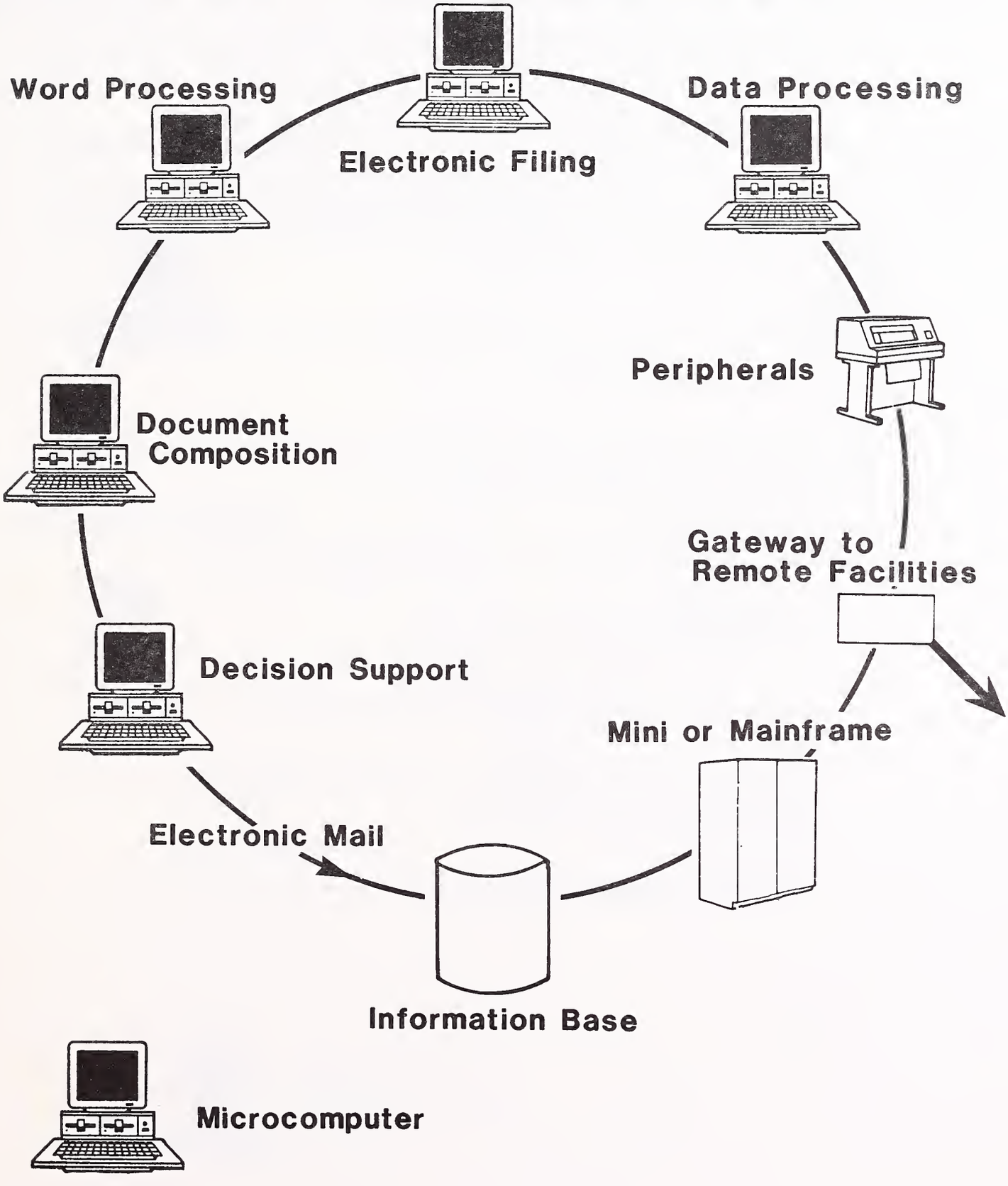
  - Increasing acceptance of local area networks.

  - Acceptance and integration of document composition and electronic filing.

- This combination of trends is expected to merge in the form of an office productivity network, having a flexible multifunctional office system; a choice of network architectures, topologies, and throughputs; a compatible family of intelligent terminals and microcomputer workstations; a variety of shared peripherals; shared functionality between microcomputers and a mini or mainframe; access to one or more large information bases; and gateways to remote facilities and information services.

EXHIBIT II-1

CURRENT TRENDS: THE OFFICE PRODUCTIVITY NETWORK



B. AN INTERMEDIATE OFFICE PRODUCTIVITY NETWORK THAT IS ALREADY FULLY OPERATIONAL

- The most advanced form of office productivity network found in operation during the survey serves four of the most common office systems: data processing, word processing, electronic mail, and decision support.

- As these systems serve the current needs of the majority of advanced users, they are most likely to be represented in multifunctional, integrated office systems during the next several years.

- One third of the respondents had a productivity network combining at least two of the above office systems.

- Most productivity networks in the sample use a bus architecture with carrier sense multiple access distributed control.

- The intermediate network is missing several important facilities:

  - Electronic filing and hard copy input.

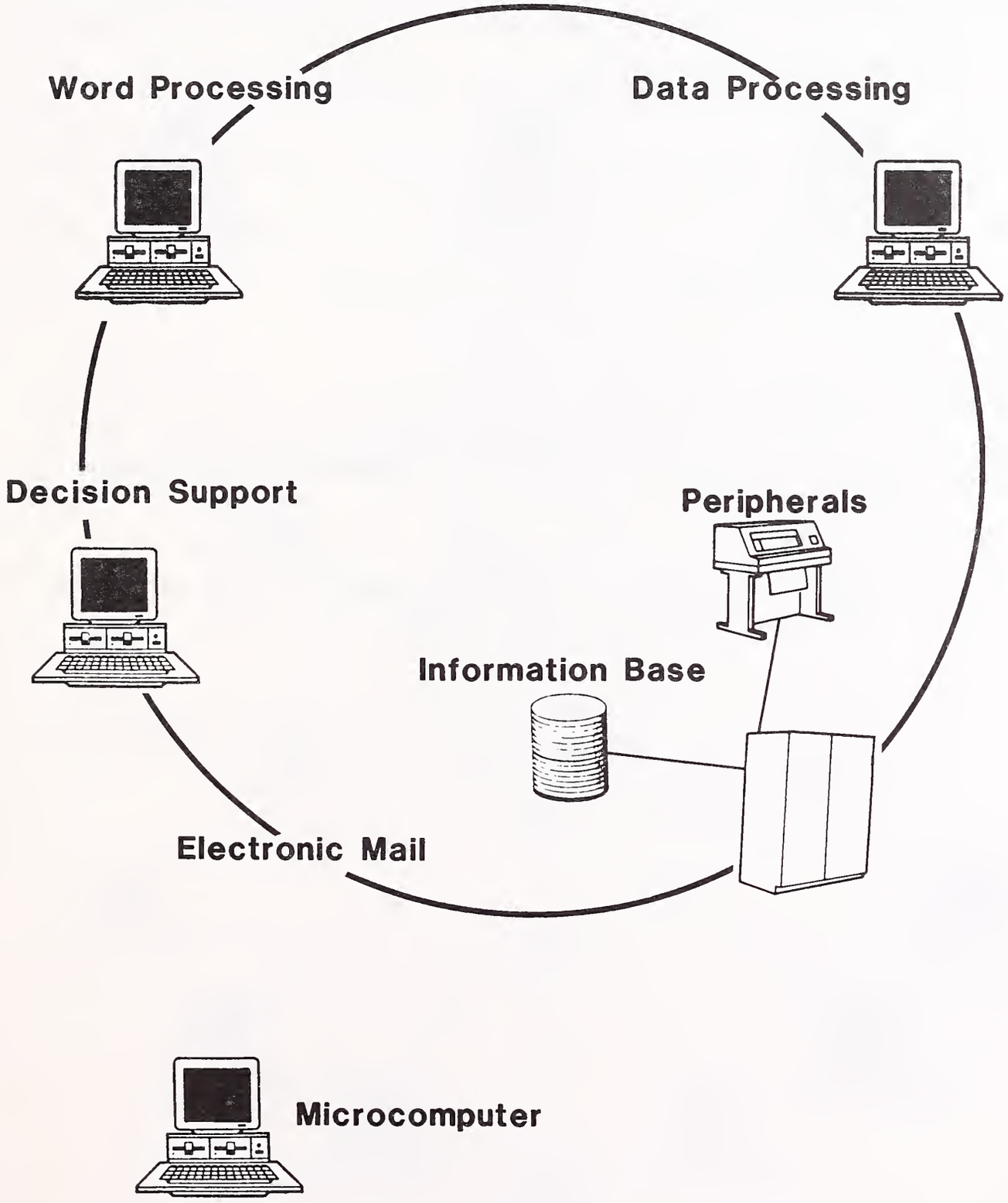
  - Document processing (although it may have presentation graphics).

  - Application software designed to take full advantage of both mainframe and micro processing power.

  - Gateway to remote facilities and external information bases.

EXHIBIT II-2

AN INTERMEDIATE OFFICE PRODUCTIVITY NETWORK THAT IS ALREADY FULLY OPERATIONAL



C. ADVANCED END USERS ON THEIR WAY TOWARD MULTIFUNCTIONAL OFFICE SYSTEMS

- A typical current approach to multifunctionality simply involves porting several microcomputers with IBM 3270 emulation boards to a mainframe through a multiplexor/controller.

  - This approach is adequate where the number of micros added is small and the mainframe is not already loaded.

  - With any appreciable growth of either micros or system loading, a major change in computing facilities is required.

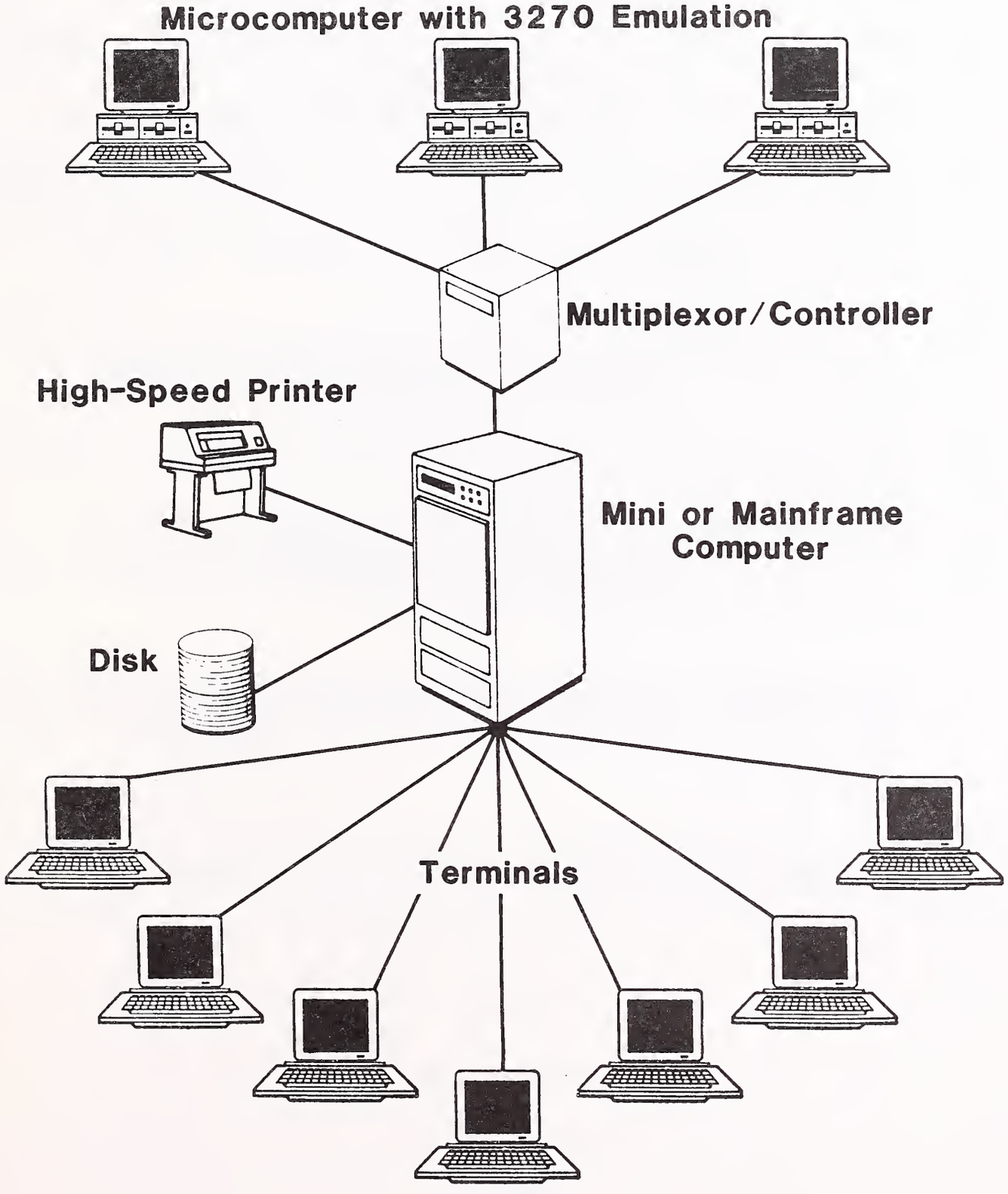
- A second approach at a somewhat lower level involves data and text sharing between otherwise incompatible machines using low-cost software translators to convert the output of one machine into a common file format that can be understood by others.

  - This approach is viable as an interim solution where the need for integration is limited to the exchange of data or text.

  - An example of this condition is a large government agency whose principal outputs are correspondence and text, and whose need is limited to word processing and electronic mail.

EXHIBIT II-3

ADVANCED END USERS ON THEIR WAY TOWARD MULTIFUNCTIONAL OFFICE SYSTEMS



D. BENEFICIAL APPROACHES TO IMPLEMENTATION

- Problems and risks seem to grow exponentially with the number of functions being integrated. Size and information security also add to system complexity.

- During the implementation, unexpected problems will arise and must be worked out along the way. Flexibility is essential.

- Any approach that permits testing the system at an early stage is immensely valuable. Software vendors and remote computing services have been of great assistance in this area.

- The single most serious problem encountered by respondents was the shortage of experienced personnel. Get started early with hiring and training.

- Obsolescent personnel can result in a serious morale problem that must be dealt with before the rumors start.

- Terminals plus PC emulation on the mainframe is a relatively inexpensive way to propagate multifunctionality without micros.

- With networks and more users, security problems can be expected to multiply. To avoid delays and cost overruns, assess needs for security before planning starts.

EXHIBIT II-4

BENEFICIAL APPROACHES TO IMPLEMENTATION

- Expect the Unexpected
- Use Vendor or RCS Facilities
- Plan for Skill Shortages
- Commence Placement and Retraining of Obsolescent Personnel
- Use Low-Cost Terminals in Place of Micros
- Assess Needs for Information Security

E. ENSURING THE FUTURE OF MULTIFUNCTIONAL OFFICE SYSTEMS

- The rapid penetration of the multifunctional micro is pushing end users in the direction of multifunctional office systems based on local area networks.
  - Substantial progress has been achieved for micros in expanding access to information, programs, and computing facilities.
  - This is increasing pressure to combine office systems, with micros playing a lead role in the merger of data processing, word processing, and electronic mail.
- At least at this stage of evolution, integration of office functions can be a complex task with substantial implications for both IS and end users in terms of the displacement of obsolescent personnel, skill shortages, and retraining.
- IS can expect to play a key role in the planning and implementation of office systems, provided:
  - They are aware of emerging end-user needs and understand their implications for IS.
  - They support end-user prerogatives for setting objectives and assuring performance of office systems.
  - They involve end users in planning and implementation from the outset.
- Three imperatives stand out as conditions favorable to successful implementation: full support of top management, clear-cut need for improvement, and early demonstration of benefits.

EXHIBIT II-5

ENSURING THE FUTURE OF MULTIFUNCTIONAL OFFICE SYSTEMS

- Problems
  - Skill Shortages
  - Personnel Obsolescence
  - Heavy Training Requirements
- End User Involvement is Essential to Continued IS Success
- Three Imperatives for Successful Implementation
  - Full Support of Top Management
  - Clear-Cut Need
  - Demonstrate Performance and Benefits Early

F. BUILDING FLEXIBILITY INTO PLANNING

- Until such time as the state of the art in advanced office systems implementation catches up, contingencies and flexibility should be built into office system planning.

- End users should be deeply involved in system planning from the outset to ensure that the resulting systems are solidly founded on real needs.

- Since training and retraining requirements can be substantial, an organizational impact assessment should be included in the feasibility study.

- Build the organizational mechanisms needed to ensure that all parties including top management are represented fairly, are aware of their responsibilities, and are held to their deadlines throughout implementation.

- Take advantage of the experience of other users who have similar needs for advanced office systems, since they are among the most reliable and willing sources of advice available.

EXHIBIT II-6

BUILDING FLEXIBILITY INTO PLANNING

- Involve End Users at the Outset
- Assess Needs for Skills and Training Early
- Get and Keep Top Management Support
- Seek Experienced End Users and Vendors for Advice and Ideas

III MARKET FORCES AND TRENDS

- The introduction of the professional, multifunctional microcomputer into the office seems destined to have a profound impact on the future of office systems.

  - For the first time, end users have had the opportunity to adapt their computational tools to suit their own specific needs at reasonable cost, without disrupting data and word processing routines in the process.

  - The result has been an unsystematic proliferation of microcomputers, which inevitably has created a set of problems substantial enough to be of concern to management. They include:

    . Incompatibility of hardware and software.

    . Inability to access electronic information bases.

    . The need for expensive input and output devices.

    . Limited computational capacity.

  - A movement on the part of management to gain control over the proliferation of microcomputers is now under way. The movement involves:

. Standardization of microcomputers and software.

. Integration with existing IS facilities.

- At this point, most managements have recognized the inherent versatility of microcomputers, and many have started the process of integration by linking them to existing mainframes.

- Because existing IS systems are largely devoted to either data processing or word processing, they do not constitute ideal hosts. Attempts to take advantage of the inherent multifunctionality of the microcomputers result, in turn, in a patchwork of interim solutions, including:

  - Emulation of terminals (e.g., IBM 3270).

  - Standardization of file formats (e.g., ASCII) to permit sharing of data and/or text.

- Since these interim solutions do not take advantage of the intelligence available in the microcomputer or the more powerful mainframes, pressures are building for:

  - Software that shares functionality between the micro and mainframe.

  - Truly multifunctional systems that are capable of serving data processing and word processing functions, and that facilitate internal communications, such as electronic mail. So far, these capabilities have been difficult to achieve effectively with single-function systems and their inherently limited audience.

- Although many end users express concern with the lack of market direction and effective standards, interest in local area networks is high, and its advantages for multifunctional office systems are being exploited with success

where the need is pressing. The trend toward LANs is expected to accelerate as user experience with LANs accumulates.

- Rapidly falling costs of random access memory and the introduction of low-cost, very high capacity optical and thin film magnetic storage devices have stimulated the development of document composition and electronic filing systems that permit integration of data, text, graphics, and images.

  - Although only recently introduced, these systems have the potential of revolutionizing these two important office functions.

  - Document composition automates one of the most labor- and skill-intensive tasks in publishing. Besides being a precursor of electronic publishing, it is a natural complement of word processing and promises to substantially upgrade the quality of internal documentation.

  - Electronic filing has the ability to capture, store, and reproduce original documents rapidly and in sufficient detail that, for most applications, manual retrieval is only rarely necessary.

    . Although it is not yet clear when or even if electronic filing will replace paper, it promises to speed the search and retrieval of documents substantially.

    . Equipped with optical character recognition and windowing, it constitutes a major advancement over word processing alone.

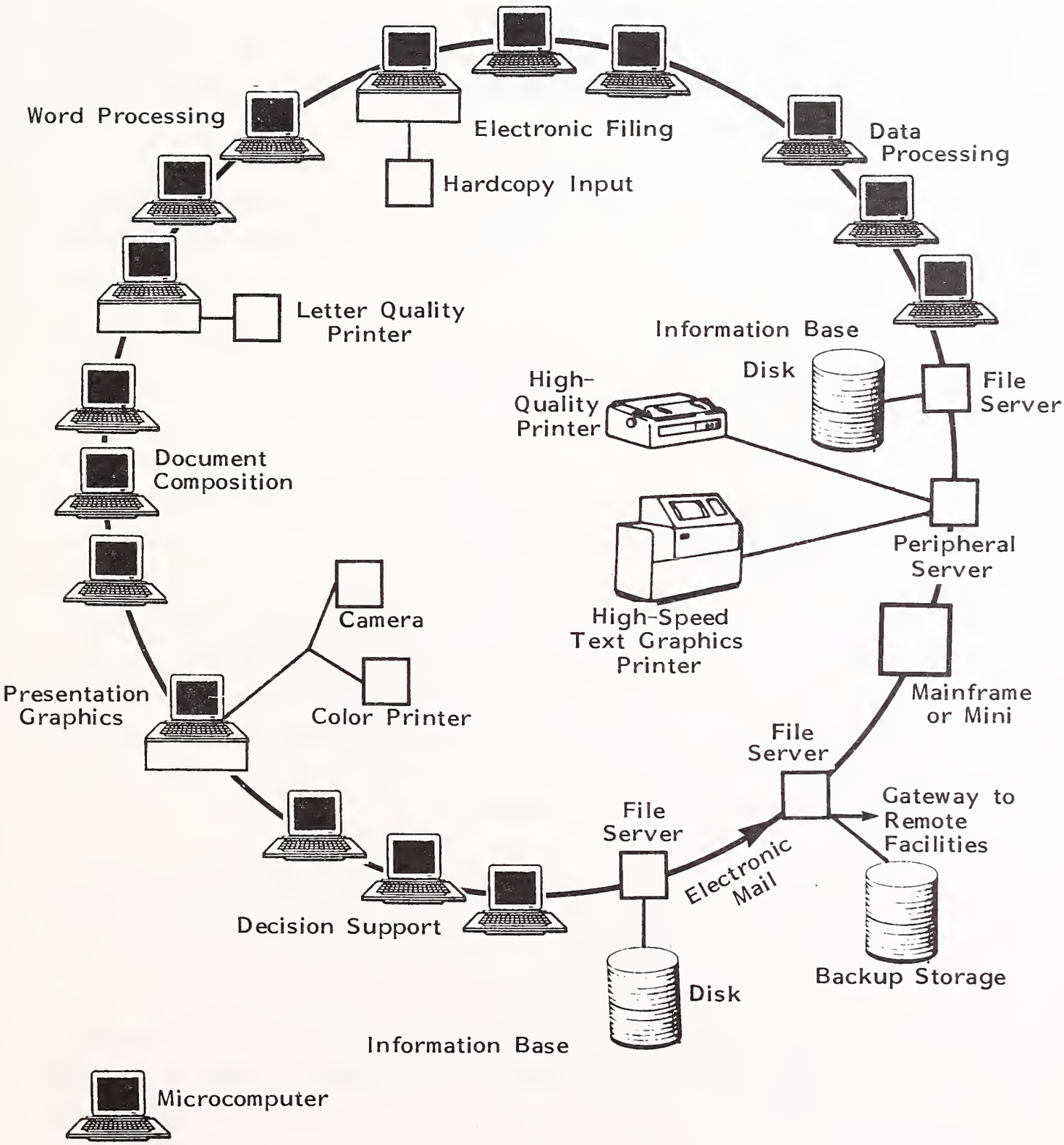
  - Although end-user experience with these new systems is limited, interest is high.

  - Both document composition and electronic filing complement existing office systems, which favor their integration into multifunctional systems of the future.

- To illustrate how a multifunctional system might be configured, Exhibit III-1 presents one possible outcome of the trends noted in this chapter.
  - In this example, the following office functions are linked in a ring network:
    - Word processing.
    - Data processing.
    - Decision support.
    - Document composition.
    - Electronic filing.
    - Presentation graphics.
    - Electronic mail.
- Other network configurations such as a bus, a star, or combinations of the three are equally possible.
  - The network also supports a variety of peripherals, a mainframe or minicomputer (for more sophisticated applications such as financial modeling), and information bases, with a gateway to other networks and remote facilities.
  - Networks of a similar pattern are currently in operation in engineering, medical diagnostic imaging, and seismic exploration applications.

EXHIBIT III-1

THE OFFICE PRODUCTIVITY NETWORK



- The nearest approach to a network solution for multifunctional office systems were two respondents with bus networks serving data processing, word processing, and electronic mail.

- Whereas a trend toward multifunctional office systems seems to be emerging, the question of who needs such systems has to be answered in the context of end-user requirements and the particular combination of office functions represented therein.

  - The survey revealed that the need for integration varies from none at present, to all five of the advanced office systems that were the subject of the survey.

  - Privacy and information security problems can be substantial, and they increase in direct proportion to the number of people having access to the systems.

  - Privacy/security requirements: "Need to know" seems to be the best approach to a solution in this area.

- Clearly, it will be several years before the advanced office systems that are the subjects of this report reach the majority of potential users, and even longer before the latter have anything approaching an office productivity network. Given the rather profound implementations of these systems, however, it is not too soon to start looking into them--assuming, of course, that this is not already under way or completed.

  - The many companies and government agencies with massive requirements for document storage and retrieval should be looking at electronic filing systems now.

  - Similar advice goes to those having large document production departments that need good graphics and images but have so far gone without.

- For those users having substantial and/or complex communications needs, local area networks may be the only solution.

IV THE STATUS OF END-USER SYSTEMS IMPLEMENTATION

A. OVERVIEW OF PROGRESS TO DATE

- The progress of implementation reported on in this chapter reflects that of leading end users, who, for reason of urgent need, chose to pioneer implementation. The selection of leading end users was necessary, since all five of the subject advanced office systems are of relatively recent origin and penetration of the market is limited.

- Leading end users were also chosen because their progress is indicative of the future for the bulk of potential end users and because their experience is valuable in avoiding problems and enhancing benefits to be derived from new systems.

- Penetration of this market segment is illustrated in Exhibit IV-1. Summary statistics reveal that:

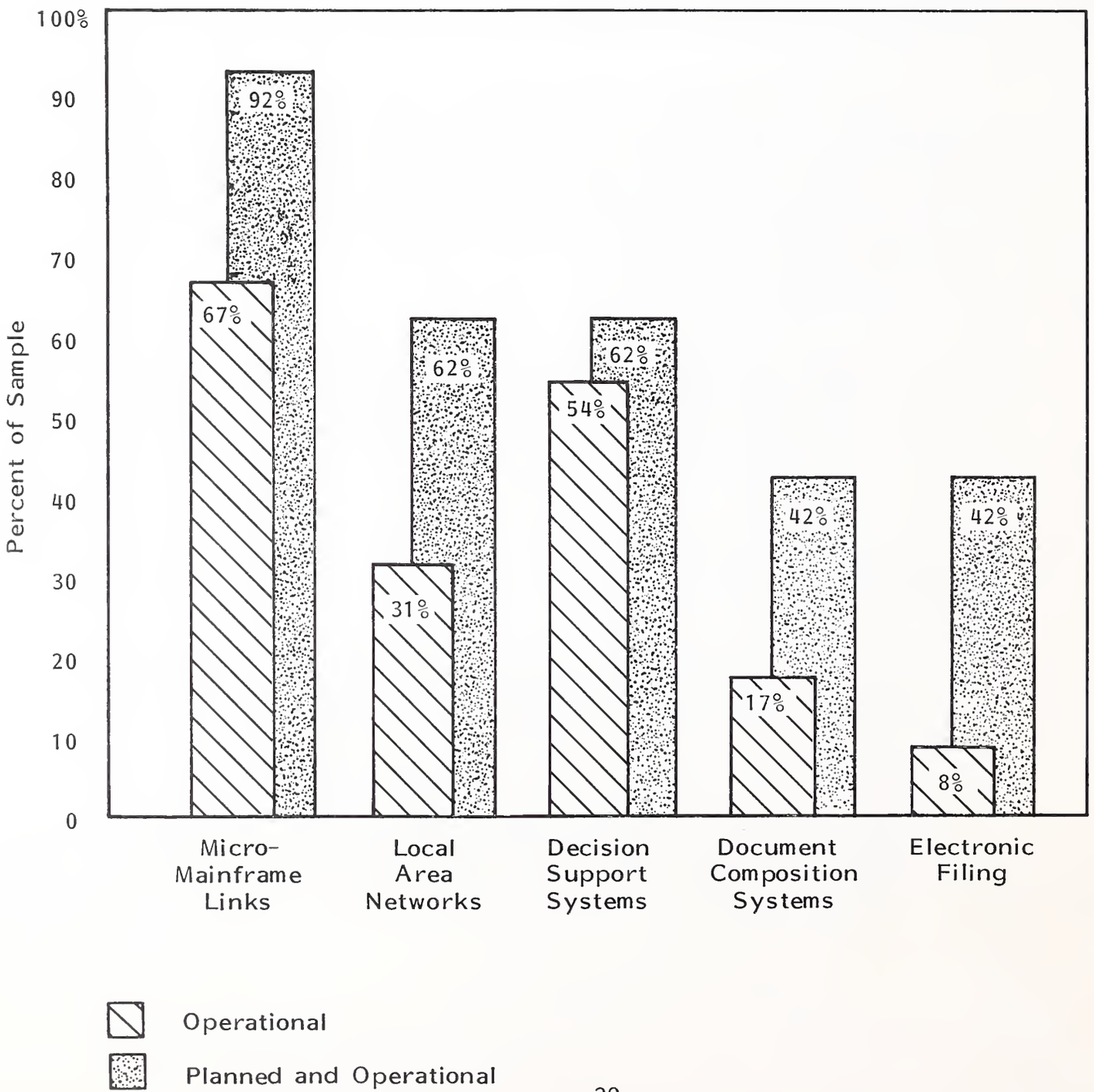
  - All respondents already have or plan to have at least one of the subject advanced systems in operation before the end of 1984.

  - One respondent has four types of advanced systems currently operating, and another has three. Over half of the respondents have at least two systems up and running, and over 80% have at least one.

EXHIBIT IV-1

STATUS OF ADVANCED OFFICE SYSTEMS – OVERVIEW

PERCENTAGE REPRESENTED IN SAMPLE



- The responses reveal substantial differences in the progress achieved to date in implementating the types of office systems chosen to represent progress in the integration of office functions.

  - Micro-mainframe linkages: Over half of the respondents have already established links between their micro and mainframe computers. Of the remainder, only one did not intend to do so because of legal restrictions on the privacy of information contained in the data bases.

  - Local area networks: LANs reflect significantly less penetration of the sample at this time. Respondents cite immaturity of the technology, lack of standards, and IBM leadership as possible reasons. However, the potential of LANs seems to be well established.

  - Decision support systems: Decision support systems are second in rank in terms of acceptance, due in part to the progress made in linking micros to mainframes.

  - Document composition: The very low number of positive responses seems to be accounted for in the historically high cost of merging data, text, graphics, and images, which is believed to have kept these systems out of reach for most corporate needs outside of publishing. However, a latent interest is obviously present, and INPUT expects this interest to gain expression as prices continue to fall.

  - Electronic filing/data processing: The survey sample did not include general purpose systems of the type sought. This is not considered surprising in light of their recent introduction. Taking into consideration this almost total lack of experience with the technology, however, the interest expressed in such systems was high.

- Because the sample was deliberately biased in favor of companies that have experience with more advanced forms of office automation, the results cannot

be taken as representative of the entire population of potential end users. They are, however, clearly indicative of considerable progress and a significant measure of success in implementation.

B. MICRO-MAINFRAME LINKAGES

- Without question, linking micro and mainframe computers is the most important and immediate objective of survey respondents.

- More advanced end users with the need to do so, have either already established such links or are well on their way to achieving this objective.

- The opportunity to integrate these office functions having been created by the introduction of low-cost, multifunctional microcomputers, linking them to mini and mainframe computers is the next logical step in this process.

- Advanced end users with micro-mainframe linkages are taking advantage of the opportunity to serve combinations of office functions. Among respondents, these combinations often include as many as three of the following:

  - Data processing.

  - Word processing.

  - Electronic mail.

  - Decision support.

- The principal market forces acting to promote micro-mainframe linkages in the sample of organizations surveyed were:

- Availability of the technology at a price that can be justified.

- Cost reduction available in merging office functions into a single system.

- Urgent planning and forecasting needs.

- The need to disseminate important information to key personnel (e.g., through electronic mail or decision support).

- A strong desire to improve the quality and timeliness of decision making.

- The principal uses of micro-mainframe linkages among respondents are as follows:

  - Downloading operating information for use in spreadsheet analysis and forecasting.

  - Facilitating on-line access to information sources outside the organization.

  - Gaining access to more sophisticated mainframe software for computation, analysis, and modeling.

  - Uploading and distributing data and text.

  - Sharing peripherals.

- INPUT has projected a growth rate of 70-75% CAGR in computer communications as a result of the trend toward micro-mainframe linkages. This survey reinforces expectations in this order of magnitude.

- INPUT also expects that the movement to link micros to mainframes will have a profound impact on internal corporate communications and will spur introduction and expansion of markets for multifunctional systems and local area networks.

- Without exception, respondents with micro-mainframe linkages in operation were pleased with the results and intend to expand their current program in concert with continuing demand for microcomputers.

C. LOCAL AREA NETWORKS (LANs)

- Less than a third of the respondents had LANs in operation.

- An equal number of respondents expects to install LANs in 18 months or less, reflecting a relatively high level of penetration (e.g., over 50%) in the near future.

- Of the remainder, most felt that measures taken to tie their microcomputers to multiuser mainframe systems were sufficient at least for the present and saw no immediate justification for a LAN.

- The objectives of LAN respondents included:

  - Integrating data processing and word processing to eliminate duplication of special purpose terminals and systems.

  - Gaining additional system functionality and flexibility through the use and linking of multifunctional microcomputer workstations.

  - Providing on-line access to corporate information bases to qualified users.

- Sharing input, output, processing, and storage facilities.

- Sharing files between microcomputers.

- Permitting wider, more convenient use of electronic mail.

- Permitting transfer of files between mini and mainframe computers.

- Permitting shared use of micro and mainframe application software.

- The relative scarcity of LANs among respondents is due in part to concerns over "immaturity of the technology."

- Besides the ability to satisfy their needs in other ways, respondents cited the following reasons for not proceeding with the implementation of LANs at this time:

  - High installation costs.

  - Lack of familiarity with the technology.

  - A substantial increase in operational complexity.

  - Potential loss of information security.

  - Lack of industry leadership (i.e., from IBM or AT&T) and standards.

  - Proliferation of suppliers with proprietary solutions.

- Industry use of the term "local area network" attempts to distinguish networks from the more conventional multiuser terminal to mainframe communications, when in fact the principal purposes of both are identical—namely, to

provide access to information needed in common with other users and to share input, output, processing, and storage facilities that may be attached.

- Since LAN is a more complex, costly, untested, and relatively new concept, many end users are currently satisfying their needs for internal communications between microcomputers and other computer facilities with hard wiring and relatively simple RS-232C emulation and data-sharing facilities.

- Several respondents have achieved their immediate objectives by adding 3270 emulation to their PCs or by multiplexing PCs through a controller that does the necessary protocol conversion.

- Others convert data and text to a common (ASCII) file format so that the output (text and data) of otherwise incompatible workstations and word processing terminals can be communicated between them, the mainframe, and other system facilities.

- For offices that do not have a general need for the multifunctionality of microcomputers (e.g., for data entry or word processing), the use of emulation and standard file formats may be the preferred solution, at least until such time as other functions are introduced.

- These approaches appear to be viable least-cost substitutes for local area networks, and INPUT expects them to be a major feature of computer-to-computer communications for some time to come.

- Respondent users of LANs were in complete agreement that LANs of any size or complexity presented special staffing problems for IS departments since personnel had had no previous experience with LANs. All had to acquire an extensive set of new skills through retraining and hiring.

- On the positive side, some very substantial benefits have been realized from end-user systems utilizing LANs. Not surprisingly, many of these benefits arise from end users being able to do things that cannot be done (or are difficult to do) any other way. Here are some examples drawn from the experience of a government agency having a large local area network.

  - The LAN reduced the time required to update a file in the principal information base from two weeks to one half day.

  - LAN reduced the response time for correspondence from as much as a month to an average of less than three days.

  - The LAN has made it possible to substantially expand the number of end-users (to approximately 150) that are distributed throughout a complex of several large buildings.

  - Multifunctional use of terminals has been achieved by installing PC emulation on the mainframe, thereby reducing the need and the cost of micros and giving all users access to a variety of PC software.

  - Both IS and end-user staffing requirements have dropped substantially, resulting in a reduction in force of 56 employees.

D. DECISION SUPPORT SYSTEMS (DSSs)

- Over half of the respondents reported that they had mainframe-, mini-, and/or microcomputer-based decision support systems in operation, which makes DSS the second most popular of the subject advanced office systems.

  - As indicated earlier, decision support is almost certainly one of the major uses for micro-mainframe linkages and probably one of the principal motivating factors in their introduction.

- Notably, all but one of these respondents also reported that their DSSs were connected to mainframes.

- The type of applications supported varies widely and includes:
  - Financial analysis and modeling.
  - Planning, evaluating, and forecasting business performance.
  - Tracking and impact assessment of exchange rate fluctuations.
  - Resource allocation and budgeting.
  - Investment feasibility studies, acquisitions, and divestments.
  - Reports and presentations.
  - Portfolio analysis.
  - Market research.

- The principal benefits sought by respondents from DSSs include:
  - Significant reduction in the time required to make decisions.
  - Improvement in the quality of decisions.
  - Reduction, or at least stabilization, in the head count of staff required to support decisions.
  - Improved access to high-quality internal and external information sources.
  - Increased use of decision support in decision making at top levels.

- The response of top management to the introduction of decision support systems has been uniformly enthusiastic.

  - Decision turnaround time has been reduced significantly, which has made it possible for management to improve the timeliness of their decisions.

  - In one case, the use of DSSs made it possible to keep the number of decision support personnel constant in the face of increasingly rapid changes in the marketplace and escalating growth in staff.

  - Top management has become more aware of key factors affecting their decisions, thus reducing the necessity for guesswork and intuitive judgment.

  - In two instances (both of government agencies) respondents had developed extensive information bases to support internal needs for planning, forecasting, and decision making. These information bases proved so useful that they have since been made available to other government agencies and more recently to industrial and commercial users.

  - It was also noted that DSSs serve to bring the work of IS to the attention of top management and to put IS in a favorable light.

- All respondents mentioned that their work in decision support was still in the exploratory stage.

  - Not only are the decisions addressed often highly qualitative, but establishing the value of decision support is even more so.

  - Unfamiliarity with decision support tools and techniques in top management has on occasion impeded the introduction of decision support systems. One respondent thought that full exploitation of the

potential of decision support may have to await a new generation of executives more familiar with computers and analytical tools.

- The inherent complexity of decision making at the level of strategic planning and policy making limits the application of quantitative analytical tools. Models of organizational behavior--including financial statements--are at best simplistic and at worst misleading.

- Whereas artificial intelligence offers some promise in this area, it has yet to accommodate these levels of complexity. The nearest approach to achieving this objective consists of knowledge-based systems of acquiring, organizing, and analyzing information in performing a specialized task. At this point there is no assurance that such systems can be built to serve general business management.

- Respondents indicate that their DSSs are largely "chauffeur driven," the principal users being professional business analysts (the chauffeurs) rather than decision makers.

  - In all cases, however, it was a principal objective of the decision support program to get management--especially top-level executives--involved as users.

  - At the top level, training is considered absolutely essential. At the same time, it is difficult to arrange, due to exceptionally tight executive work schedules and travel.

- Selection of software to support decisions was deemed to be especially critical by all respondents. Key criteria include:

  - Ease of use, especially when executives and managers are involved.

- Scope and functionality. Respondents are uniformly concerned that all contributing factors are accounted for in a balanced manner.

E. DOCUMENT COMPOSITION AND ELECTRONIC FILING

- Since very few of these systems have reached the marketplace, it is not surprising that the sample yielded only two respondents with document composition systems and only one with an electronic filing system.

  - The two document composition systems are essentially word processors with the added capability to create and merge graphics into the text. They were not designed to digitize hard copy, nor is their resolution sufficient for image processing or reproduction. Despite these limitations, they constitute precursors of fully integrated, high-resolution document composition systems.

  - The electronic filing system is being used for a retail banking application that involves the central storage of digitized customer signatures and their display at teller locations for identification purposes.

- Although respondents lack experience with these two types of systems, they expressed substantial interest in them.

  - In both cases over 40% of the respondents either had an early version in operation, planned to install one shortly, or were at least aware of and interested in the technology.

  - This disproportionately high level of interest was confirmed in a poll of INPUT subscribers, taken prior to commencing the research.

- It is also possible that document composition and electronic filing may ultimately have an even more profound impact on end-user and IS communities than the other three systems.

  - Although differing in detail, document composition and electronic filing require essentially the same technologies to perform.

  - Both involve the merger of text, data, graphics, and images; both must be capable of creating and acquiring (e.g., digitizing) all such forms of information that are available only in the form of hard copy.

  - They must also be capable of generating an accurate reproduction of the digitized documents on a screen or printer.

  - These needs become more difficult and more costly to satisfy as the requirement for resolution increases.

  - Resolutions of from 200 to 500 dots per inch are required to register images with acceptable detail. Compared with data and word processing, this involves extremely large amounts of RAM and disk or tape storage.

  - Until recently, the cost of both types of storage for this purpose has been prohibitive. As storage densities have increased and costs have come down, however, systems of both types with resolutions of 200 to 300 dots per inch have begun to appear in the market, at prices within the means of companies and government agencies whose principal activity involves extensive filing, document processing, or document production, and who can accept resolutions of this lesser order.

  - While prices are still high compared with conventional data and word processing, they are approaching a level that seems to ensure market acceptance.

- Several noteworthy facilities that appear in current versions are missing from the respondent's systems.

  - The ability to enter (digitize) documents available only in the form of hard copy is one such facility. High-resolution laser or charge coupled device (CCD) scanners are used for this purpose, often with automatic feeders.

  - When a collateral need exists to extract data for processing or to modify text contained in the original hard copy, optical character recognition can be added to the document entry devices, which makes it unnecessary to rekey this information. Current optical character recognition (OCR) devices cannot recognize handwritten characters or fonts other than those the device has been specifically programmed to recognize. Commercial versions are now available that recognize characters and, where no characters exist, acquire image information.

  - These features are particularly useful in electronic filing applications, since they make it possible to maintain a complete file of original documents in digital form. This means that for the first time it will be possible to maintain an audit trail electronically--a feature of substantial importance for a large number of office applications.

  - In addition, for large-volume filing needs, electronic filing systems use optical and thin film magnetic recording technologies. In combination with hard-copy document entry devices, these systems may be able to reduce the size of growing mountains of paper records that have come to plague many government agencies and corporations.

- Early versions of document composition and electronic filing systems, such as those needed by respondents, are principally standalones with limited functionality.

- Since data and word processing almost invariably involve filing and document generation of some kind, the desirability of combining them with document composition and electronic filing seems almost self-evident.

- Most advanced electronic filing systems provide for both word and data processing. Through the use of windowing, they permit simultaneous display of documents in storage (for reference) and documents being generated with word processing software.

- This convenience is augmented through the storage of letterheads and forms, which can be brought up on the screen, filled out, and reproduced complete with headings, corporate logos, and boiler plate.

- Thus the technologies of data and word processing are complemented by those of document composition and electronic filing, and it would appear that the last major technological barrier to the "paperless" office has been eliminated.

  - The capabilities just described are exemplified in the Wang PIC system, which is one of the first systems of this type on the market that, together with other Wang products, is capable of performing five basic office systems electronically:

    . Data processing.

    . Word processing.

    . Electronic mail.

    . Document composition.

    . Electronic filing.

- Given this potential, it is not surprising that a number of other major vendors and startups have announced their own integrated systems.

V PLANNING, PRODUCTIVITY, AND ORGANIZATION

A. PLANNING

- All respondents have well-established data processing facilities that obviously provided the starting point for entering into more advanced forms of office automation.

- It is very clear from the survey, however, that the primary motivating force behind the decision to proceed with implementation came from end-user departments rather than from IS.

  - This is entirely understandable since the end-user departments invariably had the need, responsibility, and economic justification for the system.

  - With very few exceptions, the end-user departments also had a dominant role in establishing objectives and a major role in planning.

- A third of the respondents performed detailed feasibility studies on a project-by-project basis. Several others had established ongoing interdepartmental task forces and coordination boards representing IS and the end-user agencies involved and affected. The remainder worked under directives from top management.

- Individual implementation programs varied from complete redesign and replacement of existing computing facilities to the relatively simple connection of a few microcomputers to a mainframe. Generalizations on the amount of time and effort expended in the conduct of planning are therefore of limited utility. For the record, the planning phase for implementing advanced office systems ranged in length from a few weeks to two years.

- Responsibility for coordination of planning was assigned to IS by the majority of respondents. The planning of decision support was a notable exception and was the principal responsibility of business research groups and analytical staff working closely with IS and top management.

- In all cases, end users played a major role in setting objectives and ensuring that the resulting system met their needs.

- Fully half of the respondents conducted some form of cost benefit analysis to justify the system. In most other cases the benefits were either self-evident or the respondent was operating under directives from top management.

- A number of respondents did not conduct a post-operational evaluation of performance against objectives. However, the majority of respondents either conducted formal post-op evaluations or had a system for evaluating and reporting performance on a continuing basis. Exhibit V-1 summarizes key points in planning implementation.

B. PRODUCTIVITY

- As noted earlier, respondents tended to express more than one level of objectives.

EXHIBIT V-1

PLANNING

- End Users Provide Initiative for Implementation
- End Users Set Objectives, Play Major Role in Planning
- IS Responsible for Coordinating Planning
- Majority of Users Conduct Feasibility Studies or Cost Benefit Analyses
- Few Users Conduct Formal Post-operational Audits
- But Most Have Ongoing Systems for Evaluating/ Reporting Progress

- Improvements in productivity were near the top of every list and were looked upon as essential to justifying the system. Respondents differed, however, in their methods of measuring productivity.

  - The problem of measuring productivity was most acute when respondents attempted to define organizational productivity in terms other than dollars and cents.

  - Most respondents got around the problem by stating their objectives in terms that merely indicated progress but that could at least be measured.

  - Several respondents expressed frustration with their inability to measure organizational productivity. It should be noted, however, that this inability did not prevent them from achieving most of their stated objectives.

- The most common stated objectives of respondents are listed below with explanatory comment. Note that they all reflect productivity.

  - Eliminate proliferation of standalone microcomputers.

    . This was a principal objective for over half of the respondents.

    . It is instructive that all but one respondent met this objective by limiting the choice to one manufacturer, look-alike, or emulation.

  - Institute electronic mail.

    . In two cases--both government agencies--heavy burden of internal correspondence and the need to communicate draft materials made electronic mail a practical necessity.

  - . One met this requirement with a LAN. The other simply used the mainframe to create a "bulletin board," relying on users to check in periodically for messages.

- Eliminate the need for duplication of terminals and single-function multiuser systems in multifunctional offices. (Several respondents used multifunctional microcomputers as a basis for integrating word processing, data processing, and electronic mail.)

- Reduce staff or increase output while holding head count constant.

  - . Only two respondents had set targets for reducing staff.

  - . In one case, staff reduction involved the installation of a multibuilding LAN and the development of a large decision support information base. The results were dramatic, the reduction amounting to 56 employees in total.

  - . In the other instance, an escalating requirement for support personnel was halted in the face of rapid increases in the work load.

- There is an implicit assumption that the first three stated objectives, each of which is simple enough to measure, actually resulted in an improvement in organizational productivity.

- When personnel performance was measured, productivity improvements were usually expressed in employees displaced rather than in work units per employee.

  - It is noteworthy that only three respondents attempted to measure employee productivity.

- Reduction in head count was the closest any respondent got to expressing productivity in the form of cost savings, even though the majority claimed to have conducted feasibility studies and cost benefit analyses.

- In the judgment of respondents, managements were uniformly very favorably impressed by the performance of their systems once installed:

  - On a scale of one to five, in which five means very satisfied and one dissatisfied, the average was 4.4.

  - One respondent received an award from a national professional association for his pioneering work in the application of advanced office automation technologies.

- INPUT attributes this success to three principal factors:

  - Solid support from top management. In several cases, those responsible for implementation were operating under directives from top management.

  - Easily established need for improvement. In most cases, the need for solutions was both substantial and obvious.

  - The use of small-scale pilot operations to demonstrate system capabilities and benefits. The most common example of this approach involved the use of vendor or RCS facilities and software. Exhibit V-2 summarizes productivity implications.

EXHIBIT V-2

PRODUCTIVITY

- Users Find It Difficult to Measure Organizational Performance
- Most State Objectives in Simplistic but Specific Terms
- Managements Are Uniformly Very Satisfied with System Performance
- Factors Leading to Success:
  - Solid Support of Top Management
  - Defining a Clear-Cut Need for Improvement
  - Demonstrating System Performance and Identifying Problems Early

C. ORGANIZATION

- The survey deliberately targeted government agencies and companies that ranked high in experience with advanced office systems. Hence, IS, office systems, and data processing departments are located at unusually high levels in the organizational hierarchy. This effect was exaggerated somewhat by the inclusion of two office systems vendors and a high proportion of banks, insurance companies, and government agencies, whose needs for office systems are well above the national average.

  - In slightly less than half of the respondent organizations, the head of IS is a vice-president reporting to the president or executive vice-president.

  - Over 75% either were vice-presidents or reported directly to persons at the vice-president level.

  - The remainder reported to a director of administrative services who, in turn, reported to a vice-president.

- As Exhibit V-3 illustrates, organizations that frequently report in parallel with IS under the same leadership include:

  - Office automation.

  - Office systems and procedures.

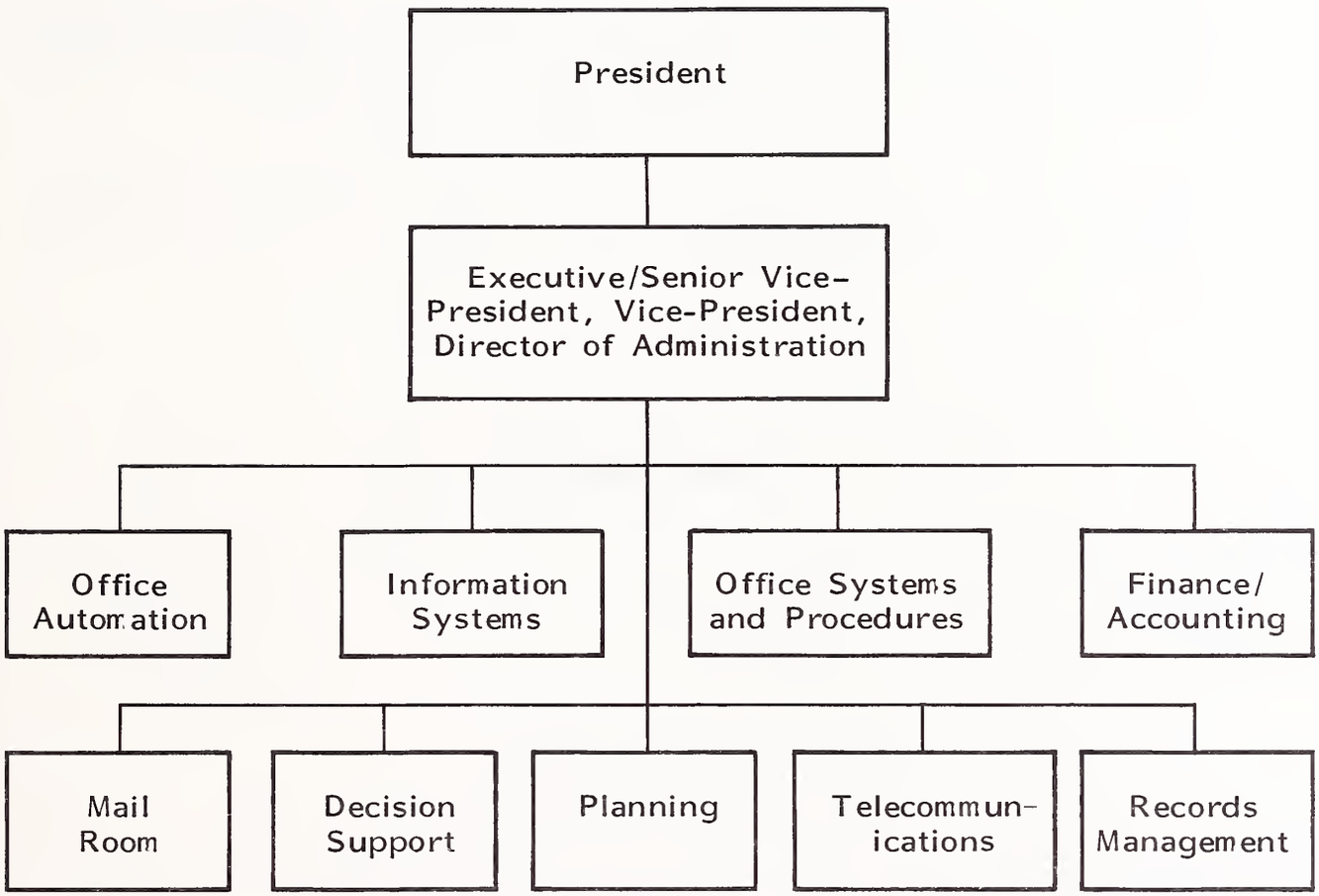
  - Finance and accounting.

  - Decision support.

  - Business planning, forecasting, and budgeting.

EXHIBIT V-3

TYPICAL CORPORATE ADMINISTRATIVE ORGANIZATION



- Telecommunications.

- Various non-DP administrative functions such as records management and the mail room.

- Obviously, a substantial potential for office systems (e.g., electronic filing for records management, electronic mail for the mail room) exists in other service organizations located in the immediate proximity of IS.

- Organizations reporting directly to IS usually include those for the following functions, as shown in Exhibit V-4.

  - Systems software.

  - Systems development (applications programming).

  - Computer operations.

  - Information center.

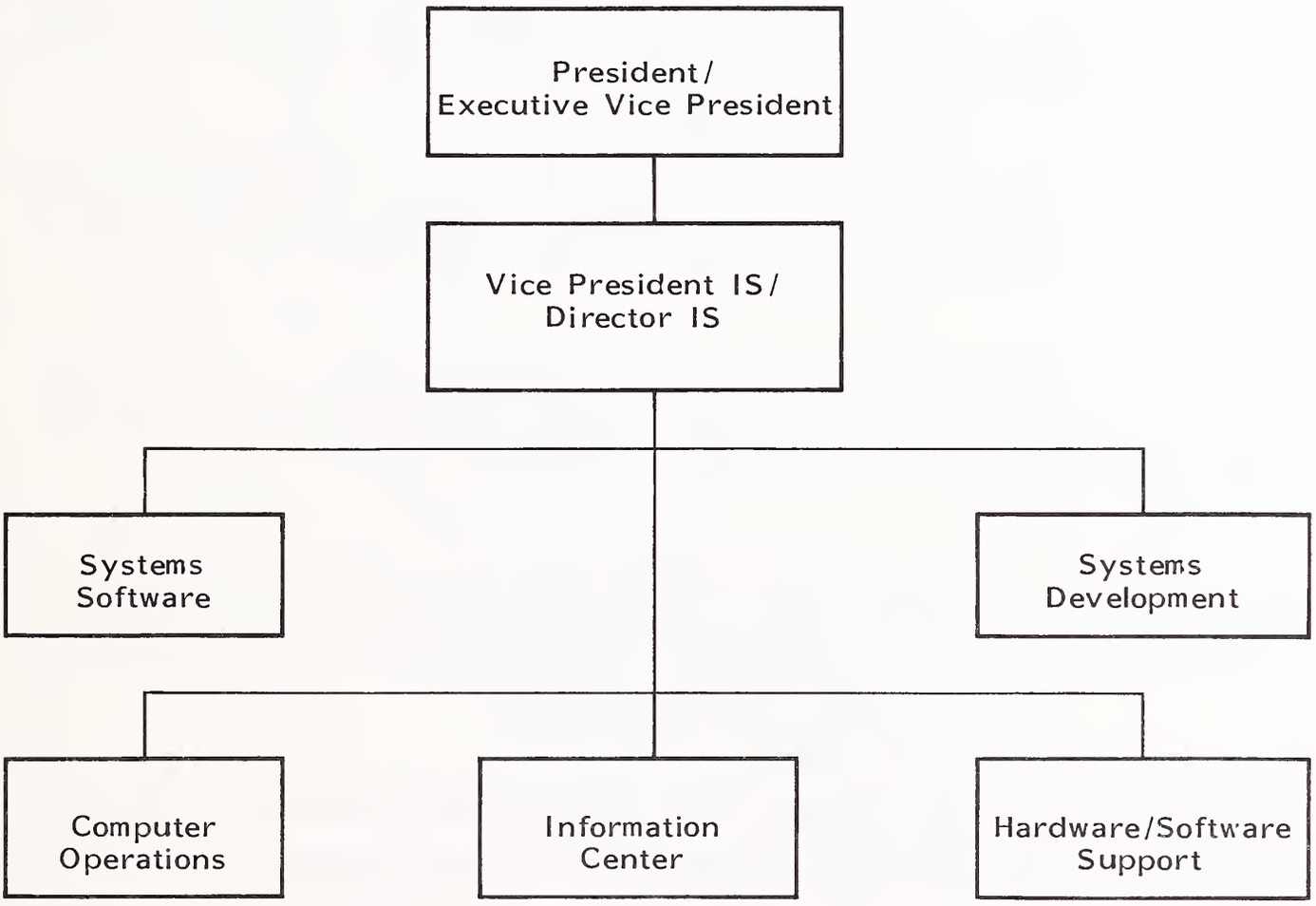
  - End-user hardware and software support.

- It is significant that some organizations have chosen not to include advanced office systems or systems design in the functions of IS. On the other hand:

  - All respondents reported that IS was responsible for computer system design, implementation, and operation. For those with LANs, IS was responsible for operation of the network. (Note: This may not prove to be the case for companies with a telecommunications department; no respondent with a LAN reported having such a department.)

EXHIBIT V-4

TYPICAL INFORMATION SYSTEMS ORGANIZATION



- Responsibility for operations did not extend to the operators of terminals or workstations, since this function was staffed with end users.

- It follows that for respondent firms at least, responsibility for performance of office systems (as distinguished from the computer system) belonged to the end user.

- With one exception (decision support), responsibility for implementation followed the same pattern as for operations.

  - IS usually chaired feasibility studies, planning, design, equipment and software selection, and coordinated planning activity from concept through operation.

  - Despite the central role of IS, all respondents gave end users a major (and in one case, a controlling) part in system feasibility and design phases.

    . Mechanisms for ensuring full end-user participation throughout ranged from a formal program coordination board representing IS and end-user departments, to a hot line for operating problems, questions, and suggestions.

    . One respondent had a formal procedure for ensuring that end-user suggestions received a full and fair hearing.

- For most respondents, the impact of advanced office systems on end-user organization was minor. Exceptions included one case in which training was a major requirement and two cases involving substantial displacement of personnel.

  - IS, on the other hand, was invariably called upon to supply significant numbers of scarce and expensive professionals. Shortages of qualified

systems and applications programmers were a frequent complaint of IS managers.

- End users seeking micro-mainframe linkages seem to have been accommodated without seriously disturbing existing organizational relationships.

- Local area networks were another matter. None of the respondents had had previous experience with LANs, and this applied to end-user as well as IS departments. Extensive training both on and off the job was required.

- Decision support seems to place a substantially greater burden on end users than on IS.

    . Most decision support organizations are relatively new, and very few of the decision makers targeted by DSS have been computer literate.

    . Since executives are invariably very busy and highly paid, training at this level is both difficult to schedule and expensive.

- There were no respondents with fully functional electronic filing or integrated documentation systems, so their impact on respondent's organization has yet to be registered. Since these systems represent a major step forward in the integration of office systems, however, their impact is expected to be substantial. Exhibit V-5 summarizes the roles and missions of IS and end users in the implementation of advanced office systems.

EXHIBIT V-5

ROLES AND MISSIONS

- IS Usually Responsible for Implementation Project Management
- Despite Central Role of IS, End Users Set Objectives, Play Major Part in Feasibility, Planning, and Design
- IS Responsible for Computer System Design, Implementation, and Operations
- End Users Responsible for Office System Performance
- Other Groups with Responsibility for Office Functions Include:
  - Office Automation
  - Office Systems and Procedures
  - Records Management
  - Decision Support
  - Telecommunications
  - Mail Room

VI APPROACHES THAT WORK

A. PLANNING

- The typical comment of respondents regarding the challenges and problems of introducing advanced office systems was that the most difficult part was getting started. Several noted a tendency to spend more time (and money) worrying about what was going to happen and planning for it than they could hope to recoup from potential benefits. Here is a selection of helpful comments from respondents.

  - Realism, a sense of proportion, and the ability to sense weaknesses in the concept are essential.

  - Take maximum advantage of other people's experience.

  - If possible, try before buying. If not, start small and test the concept.

  - Be sure you have not overlooked relatively simple, low-cost, and/or interim solutions in your existing system, as there surely are some.

  - The larger and more complex the project, the tighter time and cost controls must be to ensure that deadlines are met.

- Integration of office functions tends to be much more complex than automating any one function, and it would seem that problems and risks grow exponentially with the number of functions being integrated. Needless to say, sheer size also contributes to complexity, as does the need for information security.

  - Four of the five advanced office systems qualify in this regard, since they either involve integration or facilitate it.

  - The exception, decision support, is even more difficult to plan for because it deals with subjects of virtually infinite complexity.

  - It is almost axiomatic that as the level of complexity grows, it will at some point become nearly impossible to predict all of the things that will have to be done to ensure the success of the system.

    . In such cases, it is simply not realistic to fully plan implementation at the outset.

    . Instead, a learning process must be built into the plan to resolve questions that cannot be answered ahead of time.

- Given these high levels of complexity, users are faced with the prospect of having to solve some problems as they go along. Respondents offer this advice:

  - If in doubt, identify alternate approaches; explore contingencies; stay loose and keep options open.

  - If required to cover exceptional risks, build alternatives into the system; at least leave some hooks for the next generation.

B. ORGANIZATION AND TRAINING

- To ensure that the system is solidly founded on end-user needs, most (all but two) respondents have gone to substantial lengths to involve end-user departments in the planning process. Here are some of the ways they accomplished this.

  - Two respondents placed responsibility for planning in the hands of the end-user department.

  - Another required that all parties involved or affected by the system approve the plan before implementation could commence.

  - A fourth respondent formed an interdepartmental board of high-level department managers to review progress and coordinate systems development.

  - The same respondent set up a hot line inquiry service for all end users as soon as the system went on-line to answer questions and respond to calls for hardware and software support.

  - A fifth set up a standard procedure whereby end users' suggestions were assured a hearing and, if qualified, subjected to a cost/benefit analysis with the prospect of either acceptance and incorporation into the system, or a carefully documented rejection.

- The impact of advanced office systems on end-user departments has run the gamut of a major restructuring of departmental functions, transfers, retraining, and the acquisition of new skills.

  - Only two of these systems involved a major displacement of personnel. In all other cases, retraining, reassignment, and/or normal

personnel turnover rates absorbed the relatively small number of surplus employees.

- One of the two exceptions involved a local government agency and the conversion of a large information base from manual to fully automated operation. This resulted in the potential displacement of 56 employees. Local politics did not permit the layoff of such a large number of employees, so with the help of its personnel department, the agency established a special retraining and placement program that absorbed the bulk of the new surplus. Early retirement and attrition accounted for most of the remainder, and only three employees had to be laid off.

- To consolidate data processing and word processing and add electronic mail, a midwestern bank instituted a program to expand the use of microcomputers with mainframe linkages. Positions were found in other departments for all 36 employees displaced, 12 of whom were retrained.

- In the establishment of a corporatewide decision support organization, a multidivision, international pharmaceutical manufacturer anticipated the need for training analysts and other support personnel. The company's executives were expected to use the decision support systems, so managers anticipated a need for exceptionally user-friendly software and a specially designed indoctrination program for its executives.

  . A central training facility was established with fully functional decision support microcomputers, software, and links to the mainframe.

  . A mobile training team with portable equipment was formed to assist divisions on site, including those in foreign countries.

- Top corporate and division executives were brought up to speed using specially developed, simplified tutorial software, coupled with one-on-one instruction (one trainer to one executive at a time) that could be adopted to the tight schedules of executives.

- Because most of the trainers lacked experience in the top-level decision environment, senior IS and decision support managers were asked to conduct the one-on-one program.

- All but three respondents reported having placement and retraining programs for obsolescent personnel.

- One particularly critical ingredient present in all cases involving DSS was the full support of top management. This includes easy access to and direction from the CEO for decision support staff.

  - Without top-level direction--including frequent and familiar access to top management--decision support personnel cannot be effective.

  - In order to fully understand the potential of DSS and appreciate their limitations, executives must assume direct and personal involvement (e.g., operate the system themselves).

  - To date, this ideal has been attained by only a relative handful of executives.

C. COMPATIBILITY

- Incompatibility of equipment and software did not appear to be an overwhelming problem among respondents.

- Most respondents had experienced compatibility problems before and had simply standardized on workstations and applications software at an early stage, thereby avoiding the problem.

- Three options for dealing with incompatibility surfaced.

  - Organizationally, most respondents assigned responsibility for assuring compatibility to IS, which thereby became something of a policeman to end-user departments.

  - Two respondents provided a choice of two or three packages for particular applications based upon their popularity among end users.

  - A large word processing department deliberately set out to co-opt experienced end users who wanted to use their own PCs at home. Small, inexpensive software programs were written to convert to and from ASCII file format--which thereby became the lingua franca to accommodate otherwise incompatible end users.

D. ECONOMICS OF MULTIFUNCTIONALITY

- A number of users were quick to point out the high cost and limited need for multifunctional microcomputers, as compared with terminals, for conventional data processing and word processing functions.

- To ensure continuing benefit from the economies inherent in terminals and centralized processing, several respondents had acquired and installed PC emulation on their mainframes.

- PC emulation provides easy and economical access to the vast reservoir of simple, relatively user-friendly application software available for PCs. Mainframe software tends to be more complex and hence more difficult to use.

- PC emulation does not require the massive vertical integration inherent in mainframe-based software, and it avoids costly conversion and inflexible standards.

- PC emulation does not, of course, take advantage of the vastly superior processing power available in the mainframe. Nor does it have the ability to pass some of the processing load to local CPUs and thereby reduce the burden on the mainframe.

- When the need for multifunctionality is relatively minor or isolated (e.g., in a large accounting department or at a government agency with a heavy load of correspondence), emulation has substantial merit. But in INPUT's view, it is inherently interim in character.

  - Automated capture of data, text, and images, coupled with electronic filing and integrated documentation, is expected to substantially reduce the need for stations used exclusively for data entry or text generation, which is where usage is currently concentrated.

  - These advanced systems demand considerably more local intelligence in both workstation and operator. INPUT believes that the added cost of local intelligence--whether it be terminal, workstation, or human--will ultimately be justified by increased productivity--measurable or not.

  - Historically, application software has been written either for mini-, mainframe-, or micro-based systems. When minis, mainframes, and microcomputers are linked in a single system, processing power is thereby distributed, thus permitting the sharing of functions between

computers. Since most application software currently available does not provide for shared functionality, the principal advantage of distributed processing is lost.

- Although the number of software packages offering shared functionality is still limited, more are expected shortly.

- Respondents recommend that prospective users with this need add their voice to the demand for integrated software. Exhibit VI-1 summarizes implementation guidelines.

EXHIBIT VI-1

GUIDELINES FOR IMPLEMENTATION – SUMMARY

- Planning
  - Be Prepared for Contingencies
  - Demonstrate Benefits Early
  - Look for Simple, Low-Cost Solutions
- Organization
  - Get End Users Deeply Involved from the Outset
  - Conduct Impact Assessment Early; Expect Substantial Skill Shortages and Retraining
- Compatibility
  - Corporate/Agency Standards Essential, but Take Care Not to Kill Initiative
- Economies
  - Use Terminals as PCs
  - Push for Shared Functional Software

VII CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

1. ADVANCED OFFICE SYSTEMS

- The results of the survey reveal evidence of a trend toward integration of the office through the successful linking or merging of office functions. The trend is distinguished by:

  - Acceptance of multifunctional microcomputers by many corporations and government agencies.

  - Substantial progress in linking micros to mainframe, thus expanding access to information, programs, and computing facilities.

  - Centralization of word processing under IS.

  - Merger of data processing, word processing, and electronic mail in one system.

  - Strong interest in local area networks, document composition, and electronic filing.

- These actions and attitudes are motivated not by the demand for integration but because they make good sense, operationally and economically at this time.

- Although otherwise highly regarded, few micro-mainframe linkages benefit from the sharing of processing functions--potentially one of their most significant benefits--for lack of appropriate applications software.

- The movement to link micros to mainframes will have a profound impact on internal communications and will promote the use of LANs. However, at this time, most respondents are using a variety of shortcuts to satisfy the immediate demand for access to corporate information. For most users, full integration of micros awaits the right combination of multifunctional need and applications software.

- In spite of inherent problems in increasing their productivity and performance, decision support systems are popular with leading end users. INPUT attributes the growing popularity of DSSs to the relatively low cost of entry and to a growing appreciation and confidence in their contribution to decision making.

- Growth of local area networks is currently constrained by end-user concerns over potential problems of increased operational complexity, high cost, lack of effective standards and industry leadership, inadequate LAN system software, and poor vendor support.

- Interest in document composition and electronic filing is high considering that few such systems have been installed to date. However, awareness of the potential of these systems for further integration of office functions is limited at this time.

2. IMPLEMENTING ADVANCED OFFICE SYSTEMS

- The initiative and primary force behind implementation of advanced office systems comes from end-user departments. This includes conceptualization and objective setting, as well as a major role in planning.

- Responsibility for coordinating planning falls to IS, which also holds primary responsibility for the design, implementation, and operation of the IS/computer system.

- Because most advanced office systems involve or facilitate the integration of office functions and thereby affect organizational productivity, precise measures of performance are not available. Most respondents tended to ignore this problem and to substitute more explicit if less relevant criteria, but the lack of precise performance measures remains at least a potential barrier to the spread of advanced office systems.

- Three conditions stand out as factors favorable to the implementation of advanced office systems. These are:

  - Solid support of top management.

  - Availability of small-scale, low-cost demonstration systems (e.g., vendor or RCS facilities) to identify problems, to work out solutions, and to measure system performance and potential benefits.

  - A relatively clear-cut need for improvement.

- Advanced office systems have the potential for causing major changes in skill and work force requirements for both end users and IS. Problems include:

  - Skill shortages.

- Substantial retraining requirements.

- Displacement of obsolescent personnel.

B. RECOMMENDATIONS

- Plans should provide for contingencies; decision makers are urged to build flexibility into the planning and implementation of advanced office systems.

- End users should be involved from the outset to ensure that office systems are solidly founded on real needs.

- Since training and retraining requirements can be substantial, an organizational impact assessment should be included in the feasibility study.

- Implementation of advanced office systems can involve or affect several departments. The full support of all parties concerned including top management is needed, because the potential for political problems is high. Organizational mechanisms should be instituted to ensure that all parties are represented fairly, are aware of their responsibilities, and are held to their deadlines.

- Respondent end users and IS managements display a substantial amount of ingenuity in finding and adapting solutions to their particular needs. Most end users are reliable and willing sources of advice and ideas. Their experience should be brought to bear as early in the process as possible to minimize any prospect of major problems arising during implementation.

END-USER SYSTEMS IMPLEMENTATION APPROACHES THAT WORK

END-USER QUESTIONNAIRE

PART I - Status Of Office Systems Integration

For all of the following types of office systems, what are your

A. Current status/plans (if any) for implementation

B. Objectives/expectation - what was, will be (if not yet) implemented

C. Overall results versus expectations

D. Specific problems encountered in implementation

E. Impact of implementation on organization and skill requirements

1. Micro/Mainframe Linkages

A. _____

_____

_____

B. _____

_____

_____

C. _____

_____

_____

D. _____

_____

_____

E. _____

_____

_____

2. Local Area Networks

A. _____

B. _____

C. _____

D. _____

E. _____

3. Electronic Filing/Records Management

A. _____

B. _____

C. _____

D. _____

E. _____

4. Documentation - Text/Date/Graphics/Images

A. _____

B. _____

C. _____

D. _____

E. _____

5. Decision Support

A. _____

B. _____

C. _____

D. _____

E. _____

The remainder of the questionaire will be directed at the one type of the above office systems that best represents successful implementation:

1. - Micro to Mainframe Linkages
2. - Local Area Networks
3. - Electronic Filing/Records Management
4. - Integrated Documentation
5. - Decision Support

Part II - Planning

6. Background

A. What type of system (if any) were you using before you started? ____

_____

B. What were your reasons for wanting to change? _____

_____

_____

7. When did you first decide that something had to be done? _____

_____

How long did it take to:

A. Complete feasibility Study? _____

B. Select equipment? _____

C. Install and test? _____

D. When did the system go on stream? _____

E. How long has the system been in operation? (Calculate) _____

8. What did you replace the system with?

A. Hardware (Manufacturer/Model): _____

_____

_____

B. Software (Source/Name of Package /Application) _____

_____

_____

PART III - PRODUCTIVITY AND COSTS

9. Did you perform a formal feasibility study? _____
If yes, what requirements did management place on feasibility - e.g., what were your objectives/expectations?

A. Productivity _____

_____

_____

B. Cost Savings _____

_____

_____

C. Method used to establish feasibility (e.g., cost/benefit analysis)

_____

_____

_____

10. Did you measure the improvement in productivity or cost savings afterward? If so, what were the results?

Productivity (indicate measures used) _____

_____

_____

Cost Savings _____

_____

11. What was management's reaction? _____

5 = Very Satisfied, 1 = Dissatisfied _____

PART IV - ORGANIZATION

12. Describe the current organizational arrangement/structure of the office:

_____

_____

13. How does your company approach the evaluation of office systems (in general)?

    A. Organizations Represented?

        (1) End User _____

        (2) IS _____

        (3) Other _____

        (4) Which holds overall responsibility? _____

    B. Time allotted for study _____

    C. Are vendors called upon for:

        (1) Product Information? _____

        (2) Assistance with the evaluation? _____

    D. Is a post-operational evaluation required? _____

14. What organizations normally hold responsibility for office systems

    A. Design? _____

    B. Implementation? _____

    C. Operation? _____

15. Describe the nature and extent of end user participation/influence in the acquisition of office systems:

    _____

    _____

    _____

16. Were there significant organizational changes made as a result of or in conjunction with implementation of these office systems? (Describe)

    A. End User _____

    _____

    B. IS _____

    _____

PART IV - ORGANIZATION Con't.

17. Were these changes anticipated?_____

_____

_____

18. Did these changes result in

	Number
A. Layoffs ?	_____
B. Transfers ?	_____
C. Retraining ?	_____
D. New Hires ?	_____

19. Does your company have special programs for:

A. Placement of surplus personnel?_____

B. Retraining of obsolescent personnel?_____

PART V - PROBLEMS AND ISSUES

20. Did you encounter any of the following problems during the course of implementation?

A. Lack of top level support/direction _____

B. Conflicting departmental requirements _____

C. Unrealistic objectives _____

D. Poor choice of vendor _____

E. Faulty hardware and/or poor support/service _____

F. Faulty software and/or poor field support _____

G. Excessively complex operational requirements _____

H. Incompatibility with/between

(1) Micro/Mainframe _____

(2) Operating Systems _____

(3) Network Protocols _____

(4) Peripherals _____

(5) Application Software _____

(6) Other_____

I. Lack of or inadequate software for:

(1) Integration of micro and mainframe_____

(2) Application software with shared functionality_____

J. Other (Name)_____

_____

21. Please describe the four most serious problems encountered during implementation and how they were handled:

A. Problem:_____

_____

_____

Solution:_____

_____

_____

B. Problem:_____

_____

_____

Solution:_____

_____

_____

C. Problem:_____

_____

_____

Solution:_____

_____

_____

D. Problem:_____

_____

_____

Solution:_____

_____

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